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Gas Journal

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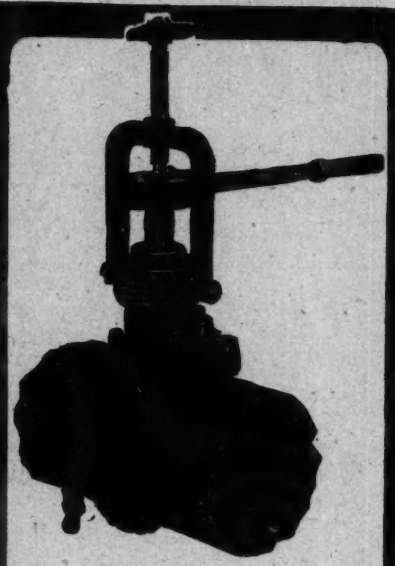

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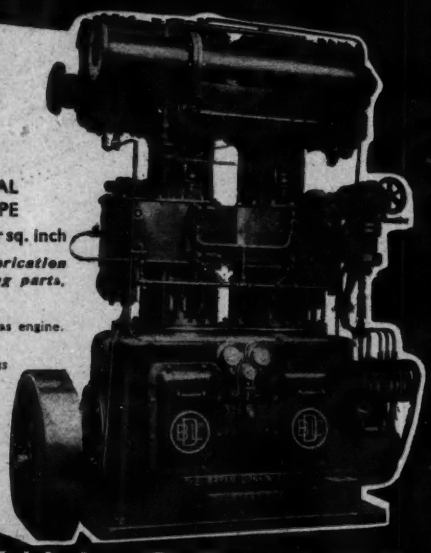

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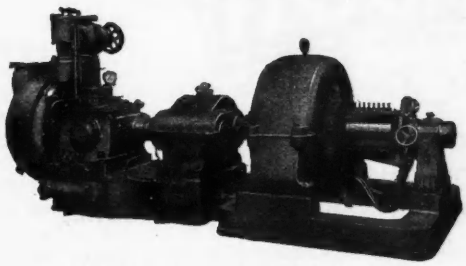

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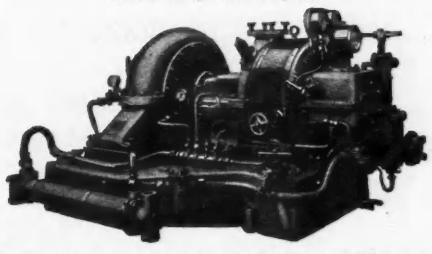

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We have only been able to secure a very limited number of Trade Diaries for 1944, copies of which we shall be pleased to forward to customers on application. To comply with Government regulations applications must be accompanied by one penny stamp. If some requests cannot be complied with, the penny stamp will be given to the Red Cross Fund to save paper, postage and correspondence.

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GAS JOURNAL, DEC. 22, 1943
VOL. 242 95th YEAR No. 4205

EDITORIAL NOTES

OTHERS ARE NOT SHY

THERE have been reactions of two kinds to our discussion last week of what we described as the "negative" attitude of the Gas Industry, as a whole, towards realities, especially in comparison with the very positive optimism which other fuel interests are taking no pains to conceal. Why, indeed, should they? It is therefore quite understandable that others besides ourselves in the Industry are becoming impatient at the single-track mindedness which is afflicting gas and blinding it very largely to realities in the dense fog of hypothetical ownerships, constitutions, integrations and the like. As we showed last week, electricity, too, has as many problems of this kind as we have, yet the worry of them is not all-absorbing, and when people clamour for a better standard of living for after the war they are not told, "Yes, if only we can get our internal difficulties resolved first."

Again, what industry in the world has lived for the past 40 years, is living to-day, and is faced in the future with so many uncertainties as coal? Yet so keenly on the utilization side, which is the one that most interests the average man and woman, have public relations been developed, especially in quite recent years, that no doubt whatever is left in the public mind that here indeed is a live industry, ceaselessly and skilfully planning for the future good of humanity. Only last week at the Annual Meeting of B.C.U.R.A., which through adroit handling has veritably become the equivalent of a housetop, Sir Evan Williams was able to proclaim the benefits which are about to accrue to mankind through coal research—"now by far the largest of the co-operative industrial research enterprises in this country." He spoke in glowing terms of largely increased grants by colliery owners and of co-operation by the mineworkers—an acknowledgment, if ever there was one, of the fact that differing opinions on internal structure do not alter the basic purpose of an Industry, which is to serve the public—whether for gain or merely for love. He added that the coal industry has "undertaken the responsibility for" hydrocarbon research in view of the paramount importance of deriving from coal not only heat and power for the home and for industry, but also liquid fuel and materials required by the chemical industry, and he spoke with complete confidence of developing synthesis processes far more efficient that the German Fischer-Tropsch process. And lest all this should appear a little distant to the average man and woman, they were assured in quite simple terms that "not the least remarkable feature of this effort by the British coal industry is the benefits that will accrue to coal consumers in the form of increased efficiency in the utilization of coal."

We should have found it most remarkable if the funds, especially that part of them which we subscribe as taxpayers, were proposed to be spent for any other purpose than the consumer's benefit, but we will let that pass, noting only that, as a serious contribution to the nation's fuel problems, the Address would have been more impressive if it had contained even the briefest reference to the part which gas and electricity might be expected to play in purveying the said "benefits" to the public. It is this aspect, no doubt, which has led a valued correspondent of ours to refer to the "amazing (and *amusing*) claims" of Sir Evan Williams, because surely the all-raw coal-burning era which the unthinking might well infer from Sir Evan's Address is hardly a part of even B.C.U.R.A.'s keenest enthusiasms. Yet we do not for one moment blame the coal industry for this type of propaganda which states unequivocally what a particular industry is planning to do, and which is undoubtedly most encouraging to the millions who derive much spiritual sustenance in the rigours of to-day through the process of estimating their prospects of better things hereafter. Such declarations of policy must be exceedingly useful also to quite an array of Ministries which, in these times, are largely concerned with assessing the potentialities of various industries in post-war reconstruction.

In this connexion it is interesting once again to refer to a passage in Sir Evan Williams' Address in which he quoted words of Dr. E. W. Smith presiding, at a previous B.C.U.R.A. conference, as President of the Institute of Fuel. Dr. Smith, approving of what some people called the "unconventional" methods of the Association, had said: "It is infinitely better to do 100 things and make 25 mistakes than to do nothing and make none. Publicity for B.C.U.R.A. has been necessary. The public have had to have their attention drawn to the fact that there is a coal industry; that coal matters; and that someone is going to handle it."

Gas matters, too.

The President of
The Institution of Gas Engineers,
Mr. James Jamieson, and Mrs. Jamieson,
send to all members of the Institution and to other friends and acquaintances in the Gas Industry their Cordial Greetings for Christmas and their Best Wishes for Peace and Happiness in the New Year.

GAS HAS A STORY

IT is therefore not surprising, as we have said, that many in the Gas Industry, even many who are intensely interested in internal reorganization, are becoming alarmed at the continued absence of any facilities for attending to other aspects of the Industry's future. What is surprising, however, is that members of our Industry should themselves have "fallen for" the propaganda of other industries, to the extent that some have even argued with the views we expressed last week on the gas appliances which will be available immediately after the war.

We are quite certain it would be not only foolish, but inaccurate, to designate as a bogy the new coal fire which Sir Evan Williams, in *his* Address, described as having-been evolved by B.C.U.R.A. It is anticipated that this fire will not only dispose of the smoke problem, but have an efficiency very nearly double that of the old-fashioned fire. By means of warm air, too, it will heat upstairs bedrooms as well as the living-room in which it is installed. It will burn continuously day and night without relighting, and will need cleaning out only once a week.

And well it may, seeing that Sir Evan himself prefaced the announcement by acknowledging that for more than a century a host of inventors and fireplace designers have been trying to eliminate the well-known defects inherent in the domestic burning of raw coal; that since 1851 more than 300 patents have been taken out which claimed to give the coal fire either greater efficiency or less smoke; and that not one of those many devices proved successful in practice.

We have no intention whatever of attempting to belittle this interesting forecast; if people must burn raw coal, we wish the new invention the very best of fortune in the national interest. But if there are some in the Gas Industry who are scared by such announcements, we must remind them of the almsot unbroken record of continuous improvement in gas-consuming

§§

appliances since the year 1851, and especially the accelerated advances which were made between the two wars. These culminated in apparatus which, quite frankly to our disadvantage in some respects, left little scope for improvement unless the fashion in externals should change. The speed with which these models can be produced in quantities after the war must obviously depend upon Government priority in labour and material, but we shall be surprised if the makers are unable to turn them out just as quickly as ever gas undertakings can fit them. With these in their hands, they need not worry overmuch about competitive appliances as regards efficiency, appearance, or up-to-dateness generally, because it will indeed be surprising if the makers of coal or electricity consuming appliances, alone among all the industries of the country, are able immediately upon the cessation of hostilities to place new models of consumer goods on the market.

While we think, therefore, that the Gas Industry will be extremely well placed at the outset, far be it from us to suggest that we should calmly contemplate present methods and the appliances of to-day as having achieved the ultimate, though it will certainly not call for any agitation on the part of the supply side to stimulate progress. Competition among the makers, the quest for survival, and the spirit of enterprise which as a whole has always inspired them, will see to that. It is well known that many good things were on the test bench at the outbreak of the war, and our columns have testified many times since that research has not stood still, and that there is healthy controversy in the Industry on the merits of new methods of combustion—even of old methods revivified. However, research and the test bench are two stages which are very different from the third—full-scale production—in their demands on labour and material, and even preparations for this third stage have clearly been out of the question while the makers have been "otherwise engaged" to a very high percentage of their capacity. We shall be surprised if other industries are not in like case, and it can therefore be assumed that we shall have something entirely new to show just as soon as they have. But whatever we may have in the way of novelties in the offing, we should be desperately frightened of the situation if we imagined that the makers proposed holding up production of anything at all until such time as they could put into full production a range of entirely new models. In fact, in the public outcry for appliances of the remarkable standard already achieved that is bound to be heard in early post-war days, such a policy could be nothing but calamitous to the Gas Industry. To the public it would be so manifestly unfair that it is unlikely it would even be permitted.

GAS IN INDUSTRY

THERE is much useful advice and considerable suggestion in the Paper on the relationship between the industrialist and the supplier of gas which was given recently by Mr. H. R. Hems and which is being published in our pages. The Author, who is Chairman of the Industrial Gas Centres Committee, and whose work over many years in Birmingham is well known, is by experience and intimate knowledge well fitted to talk authoritatively on the subject, and we have little fear that sight will be lost of his interesting comments. That the demand now for town gas for industrial processes—or, rather, wartime purposes—exceeds supply is well enough known. Never before has the Gas Industry received from industrialists and engineers such appreciation as is now so freely given to the utilization of town gas. This, as Mr. Hems pointed out, creates a position of both responsibility and, in a way, danger. We must not allow our advantage to be removed. As a matter of fact, given the right attitude, the right approach, and—not least important—the right personnel, we have little fear that after the war the industrial load of the Industry will be far greater than it was before the war; recognition of the merits of industrial gas are overwhelming and industrial gas development ought to stride forward giant-fashion, and the prospects should be assessed of the particular undertaking, the district, and the country as a whole, not merely as a wartime but as a peacetime measure. No doubt post-war there will be redistribution of population, and smaller undertakings need to don a thinking-cap if they desire to cope with likely industrial demand. As regards availability of gas supply, much has already been accomplished in the harnessing of coke oven gas, and more remains to be done in this direction and in the general integration of gas supply. As regards price, this is an important consideration, of course, but not the only one or in many instances even the main one.

Industrialists are more fully realizing that fuel costs often represent a slight, and only a slight, proportion of the total costs of manufacture of any product. Variations in fuel costs, variations of a minor order, are for the most part insignificant. What matters is the over-all result as measured by the all-in cost of the finished product in relation to its selling value. Our product will have to be sold on the basis of merit as well as of price. The gas-consuming appliance or furnace put forward to carry out a process must be in keeping with the intricacy of that process; it must be part of the process. The efficiency of application of the burner or furnace, and the appearance of the appliance, must have prominent place in future development.

We have mentioned the matter of personnel, and, as Mr. Hems remarked, the work of industrial gas development does present many appealing features. Few occupations can provide such a wide and continually varying series of engineering, chemical, and metallurgical propositions; and from the idealistic aspects we can count the elimination of smoke, the betterment of working conditions, and the better conservation of coal in the national interest. And the men who are to extend the industrial gas business must be knowledgeable and have adaptable minds. Mr. Hems is sure that the old idea of one man as an industrial gas engineer being a specialist in the multitude of processes with which he is likely to come into contact has gone, and specialization on certain processes by individuals must be encouraged, providing there is a sufficiently satisfactory organization within a supply undertaking or in the Industry generally to make the greatest use of the work of those specialists. This is one of the first requirements. However good our product may be in its industrial application it must be put over the right way. The field, larges cale, medium scale, and small scale, is immense, and it will be a competitive field. Its extent is glimpsed in the numerous examples of the application of town gas given in the Paper to which we refer.

Institute of Fuel

An inaugural meeting, with the object of forming a Scottish section of the Institute of Fuel, was arranged recently by Mr. W. G. Marskell, of Babcock & Wilcox, and Mr. Arthur Grounds, of Scottish Tar Distillers, Ltd. There was, we understand, an enthusiastic attendance under the Chairmanship of Professor A. M. Bryan, of the Shotts Iron Company, Ltd., and an *ad hoc* committee was appointed, the members of which are representative of every branch of fuel production, preparation, and utilization. The first meeting of the new section is to be held early in January, when it is hoped that Dr. E. W. Smith, President of the Institute, will address the audience. We learn with interest that a considerable number of applications for membership have been received.

Personal

Captain J. G. CANNING, R.A., fourth son of Mr. J. H. Canning, O.B.E., J.P., of Newport, has been gazetted as having been Mentioned in Dispatches for distinguished service. The award is dated Sept. 23, 1943. Captain Canning, who was formerly on the editorial staff of the "JOURNAL," was last heard of in August as a prisoner of war in Northern Italy.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Letters to the Editor

Benzole Recovery

DEAR SIR,—I was very interested in the Paper on benzole recovery by a Scottish Gas Engineer published in your issue of Dec. 8. There are, however, one or two points on which I cannot quite agree with the Author. I first commenced benzole recovery in June, 1937, and can agree on the allowance of 1.5 therms per gallon of benzole recovered, but the volume of one gallon of benzole at N.T.P. is 40 cu.ft., this figure being confirmed in the book on Motor Benzole by Hoffert and Claxton. I note that the Author allows 1,000 cu.ft. per gallon of benzole extracted, per ton of coal carbonized.

The reason why I am so interested in this particular point is due to the fact that the gas measured by the station meter in my works is saturated. After passing from the station meter the gas is then dried and benzole extracted, and the yield of benzole per ton of coal carbonized can be seen from the figures for the twelve months ended March 31, 1943, together with the average of the analysis of the benzole sold to the National Benzole Association.

During the recent cold spell, and with the deterioration in the quality of coal, I was obliged to shut the benzole plant off in order to meet the demand for gas, anticipating that with a make of 50.4 gallons per day, when carbonizing 30 tons of coal per day, my volume could be increased by 40,000 cu.ft. per day, but this did not materialize, so I have now put the plant back in operation.

With regard to water, I notice that this is charged at 1d. per 1,000 gallons, which I presume represents pumping costs.

The quantity of benzole sold during the year was 12,280 gallons, and the revenue received for this was £872.

In conclusion, I may say the plant in operation at my works was made by Kirkham, Hulett, & Chandler, and has been in continuous operation from June 1, 1937. The cost of repairs has been £5 for one set of tubes in the final condenser.

CARBONIZING RETURNS, 1943.

Total gas made in cu.ft.	121,462,500
Therms	522,288
Gas sent out in cu.ft.	121,013,300
Therms	520,357
Coal carbonized in tons	7,144 17 2
Gas made per ton of coal carbonized in cu.ft.	17,000
Av. C.V. of gas before stripping	461.84
Quality distributed B.Th.U. cu.ft.	430.32
Therms per ton of coal carbonized (declared C.V. 430)	73.1
Benzole recovered in gallons	12,647
Gallons of benzole per ton of coal carbonized average	1.77
Residuals Recovered.	
Coke (in tons) available for sale	2,298 0 0
Coke available for sale in cwt. per ton of coal carbonized	6.43
Coke actually sold in cwt. per ton of coal carbonized	5.94
Breeze recovered in tons	714 10 0
Breeze recovered in cwt. per ton of coal carbonized	2.0
Pan coke recovered in tons	139 6 2
Cwt. of pan coke per ton of coal carbonized	0.39
Tar made in gallons	71,440
Gall. of tar per ton of coal	10.0
Gall. of oil used for the recovery of benzole	1,214
Gall. of oil used per gall. of benzole recovered	0.096
Analysis Received from the National Benzole Company.	
Sp. Gr. crude benzole	0.874
Column test at 100°C.	50%
,, ,, 160°C.	88%
Once-run benzole	88%
Sp. gr. of once-run benzole	0.874
Grade	C

Yours faithfully,

Dec. 13, 1943. "ANOTHER BENZOLE RECOVERER."

A Warning

DEAR SIR,—I attended an exhibition recently in which I saw two kitchens, one equipped with gas, the other with electricity. "Exhibition" is the right word, although possibly not in the sense the promoters intended. This uninitiated housewife was under the impression that what she was going to see was a new kitchen that would be modern and up-to-date, saving labour, arranged intelligently, and equipped in a new way. Alas for her hopes!

What was shown in the gas kitchen was just the ordinary kitchen with a few extra cupboards. Certainly the cooker was a nice modern one, but with the usual type of oven below the boiling rings. Some women may prefer this, but I expected to see a more modern and intriguing type—something new; especially when we are told that we are to see the kitchen of the future. The sink had evidently been planned by a man who, even in these days of lack of help in the home, had never given his wife a hand in washing-up. There was no space on the left-hand side of the sink on which clean dishes could be stacked to drain—about nine inches was all the space allowed. Both sides of the draining board were quite flat and on a level with the sink, without grooves to carry away the water. And, biggest crime of all, the plate rack was placed on the right of the sink. The designer was under the delusion that all women are left-handed. If they are not, every time the poor creatures wish to place a plate in the rack they have to perform a conjuror's feat, reaching over a pile of dirty plates or pots with the wrong hand—rather like the pianist who crosses one hand over the other to reach the treble when playing an intricate piece of music. And the metal binding on the edge of the bench was just a trap where dirt could lodge. The pot rack was merely a little oblong box with one side missing. Levels up and down and nothing at all new in this kitchen to thrill the housewife, and many things she would not for a moment tolerate in a new and up-to-date home. Surely no woman had been consulted when this kitchen was erected.

The electric unit kitchen was, if anything, worse. Everything crammed all together, no room for working, cupboards at floor level in which to keep food, and where the beetles would have a holiday. No woman wants to keep food near the floor. Imagine making a pudding in which the ingredients were flour, margarine, currants, sugar, spice, baking powder, dried egg. Stooping every time to take all these things out of the cupboard? A working woman—and this kitchen was planned for working women—may be stout, the mother of a family, and why should she have to do all this bending, not to mention the damage to precious stockings? And in cooking the meal there would be no place on which she might place all the things she needs like bowls, tins, milk bottles, &c. And the position of the plate rack! Words fail any sensible woman.

There were many other things in both these kitchens which should never have been suggested, and many things which should have been included, but a busy women with a home to run does not have the time to spend in telling the experts all the things they should do. And if they need so much telling then they are not experts. They will have to do better than this if women are to be satisfied with their kitchens of the future. It is an insult to our intelligence to offer this stuff as the ideal kitchen, for it isn't anywhere near it. It justs won't do.

Yours faithfully,

Dec. 14, 1943. "A DISAPPONITED HOUSEWIFE."

"Gas Fuel in Post-War Planning"

DEAR SIR,—I very much appreciate publication in the "GAS JOURNAL" of Oct. 13 my effort indicating the state of gas and other fuels in the U.S.A. which, as you say, constitutes an addendum to Mr. T. A. Tomlinson's Paper earlier in the year. It is very kind of you to consider my effort of sufficient interest to merit an editorial.

It is quite understandable that you should express surprise at the efficiencies I used. To arrive at an average efficiency is no easy task and the figures are not intended to be exact, but I believe any changes made to them will not substantially alter the "useful therms" shown. In order to clarify the figures I quote from my work-sheet on efficiencies:

	Efficiency.
Anthracite coal.	
Assume used in central heating ... (Authority, Anthracite Institute.)	50%
Bituminous coal.	
When for central heating about 45%, higher in boilers and gas-making, lower in other uses. Assume average of ... (Authority, Bituminous Coal Institute.)	45%
Oil.	
Motor fuel 51% of total, efficiency, say, 7%, or useful efficiency 3.57% of total oil	
Heating fuels 49% of total, efficiency, say, 60%, or useful efficiency 29.40% of total oil—average 3.57 plus 29.40, say ... (Authority, American Petroleum Institute.)	33%
Gas.	
Central heating 75% to 80%.	
Cooking, 50%.	
Industrial heat.	
Average, say ...	60%
No figures are available for quantity of natural gas used for central and space heating.	
Electricity.	
Steam, which is 66% of total, say, 19%, or useful efficiency 12.54%.	
Hydro, which is 33% of total, say, 76%, or useful efficiency 25.08%.	
Average 12.54 plus 25.08, say ...	37%

Since I sent my figures to England I have seen a Paper, "City Gas," by W. L. Jones and F. E. Vandaveer, printed in *Industrial and Engineering Chemistry*, Vol. 33, July, 1941, p. 852, in which they give the following efficiencies:

Bituminous coal:	50%,	which is	5%	in excess of my figure.
Gas:	80%	,,	20%	,, ,,
Coke:	60%	,,	10%	,, ,,

In view of these I feel my figures are justified, and, as I stated, any adjustment to them will not substantially change the current overall story of fuels and their value to the human race.

If anyone cares to adjust the figures with an efficiency they feel is more exact, they are, of course, quite in order, as I only wished to indicate a trend, and did not attempt to be exact with such a debatable factor.

The main point to remember when comparing English and American efficiencies is that much English heating is done in open fires of low efficiency, whereas most American heating is done in closed furnaces of very much greater efficiency.

424, *Madison Avenue*, Yours faithfully,
New York. West's Gas Improvement Company, Inc.,
Nov. 10, 1943. S. J. BEALE,
General Manager.

[It appears to us that a major consideration regarding the further useful data which Mr. Beale sets out in his letter is that in the United States solid fuel is for the most part used in apparatus which is much more efficient in providing the "useful therm" than is the open fire so popular in our own country.—ED. "G.J."]

Gas *v.* Electricity in Rural Areas

DEAR SIR,—Is it not of general interest to add to your leader on "What Progress?" p. 709, Dec. 8, the prospect of the association of 22 electric power companies supplying the rural areas? Their Memorandum of Nov. 24 suggests that "undertakers should be obliged to submit proposals periodically for development of domestic electricity and lighting in any part of their areas—where there is prospect of a reasonable return."

Am I unreasonable in thinking there is room for progress without waiting—*i.e.*, do they want to render service? *The Times* of Aug. 19, 1942, said: "The well-being of rural communities is the first objective." And on March 27, 1942, the *Times* reported our Prime Minister's statement at Caxton Hall: "We must make sure that our fellow-countrymen and our Allies have the best service from us that we can give."

For comparison with municipal enterprise I learned from *Electrical Review*, Nov. 19, p. 687, that for the rural county area of Norwich plans and estimates for complete electrification have been submitted.

You mention on p. 711 of your issue of Dec. 8 the purchase of the non-statutory gas undertakings at Wooton Bassett, Highworth, Fairford, and Farringdon. Is there a uniform, equitable basis for such purchases, such as was included for compulsory purchase of non-statutory electricity concerns in Electricity (Northern Ireland) Act, 1931, Part 2/8/1, p. 7—"paying the value, determined by arbitration or agreement, as at date, of land, buildings, works, materials, plant, and goodwill?"

Herne Bay,
Dec. 8, 1943.

Yours faithfully,
THEODORE STEVENS.

Progress in Kitchen Planning

Since the meeting of the South-Western District of the B.C.G.A. at Exeter, reported in the "JOURNAL" of Nov. 3 (p. 559), Miss Jane Drew, F.R.I.B.A., consulting architect to the Domestic Heat Services Committee, has visited several of the districts, and on Dec. 15 she addressed a well-attended meeting of the Southern District at Gas Industry House, presided over by Mr. P. E. Browne (Brighton).

Good progress was reported by Mr. T. Brown, Chairman of the Domestic Heat Services Committee, who said it was hoped that Miss Drew, who was shortly to go to the United States, would have her final report ready by February. It was proposed to hold an exhibition of model kitchens in London next June, the original idea having been to hold it at the same time as the annual meeting of The Institution of Gas Engineers, but it had since been learnt that the 1944 Institution meeting was to be held at Edinburgh. However, the arrangements for the exhibition in London were going forward, and permission was to be sought from the Ministry of Works for the necessary materials not only for the London exhibition, but for a series of seven others in the provinces. In visiting the various districts Miss Drew had met a number of local housing authorities, and they had been delighted with what she had been able to tell them.

The electricity industry, said Mr. Brown, was working on similar lines, and attached great urgency to the matter of kitchen planning in relation to post-war needs, but it could be claimed that the Gas Industry was several months ahead of electricity in this respect. The Ministry of Works was preparing a programme for house building immediately after the war and had asked the fuel industries—gas, electricity and coal—for their ideas and suggestions as to the domestic heat services for the new houses. Capital and running costs had been examined, and full details were to be submitted to the Ministry within a few days.

Miss Drew described the seven plans she had prepared, two for reconditioned kitchens and five for the kitchens to be provided in various grades of post-war homes, and stressed the need for foresight in the installation of the various services at the time the houses and flats were built. Servicing costs could be reduced by one-third if there was proper co-ordination from the start. Items of equipment in the kitchen must be designed to bear proper relationship one to the other and to the rest of the house, and although the average housewife disliked the idea of standardization, there was great scope for a general standardization of units which could be much more economically and speedily provided if they were mass produced. Individual needs could be met by minor adjustments, and the different requirements of the tall and short housewife could be satisfied by providing bases of different heights for such items as cookers and sinks. Facilities for clothes drying were receiving special attention. Home laundry was a matter of varying taste in different parts of the country. In the south nearly all the heavier washing went out to the laundry, but in the north most of it was done at home. When women returned from the Forces and the factories to their homes there would be a general desire for less drudgery, more and more washing would go out, and probably only flimsies and smalls would be washed at home. For that reason present suggestions for the domestic washhouse were not based on long term usage.

In answer to questions, Miss Drew said she would go further than educating housewives; she would like to see both men and women doing a whole course in housework. Domestic heat research was not confined to the kitchen, and work was actually being done on other parts of the house. Mr. T. C. Battersby (Watford) referred to some experimental houses where the background heating was by pipes from the coke-fired boiler, and said it was considered that there should be some topping-up heat. Miss Drew said she had seen these houses and agreed that topping-up was necessary. She had studied the whole question of domestic heat, but had not considered plans for the other rooms to the same extent as for the kitchen. She was an ardent advocate of the eye-level cooker and had included it in most of her designs, but not, she admitted, in the bachelor flat kitchen. With the eye-level cooker she included the drop type of door, which, she agreed, must be arranged to function properly. It was also essential to have flues in the kitchen, and where possible there should be a hood to assist in taking away the odours of the kitchen. In recent years the kitchen had tended to become too small, but they must not go to the other extreme. There was an optimum size beyond which unnecessary walking about would be imposed upon the housewife's routine. Three sizes of cooker oven were contemplated, and young married couples should not necessarily choose the smallest, but should look ahead to the time when there would be a family to provide for. She agreed, too, that adequate light was essential in the kitchen. Consideration was being given not only to appliances, but to utensils, kettles, saucepans, &c., with a view to the most effective use and conservation of fuel. There had been too much waste in the past owing to the habit of going to popular stores and buying what seemed to be the cheapest articles. Freedom in the choice of fuel must be preserved, but this should not be any hindrance to the development of complete kitchen units.

National Gas Council

A Meeting of the Central Executive Board of the National Gas Council was held on Dec. 14 at Gas Industry House. The Chair was taken by Mr. Frank H. Jones (Vice-Chairman).

A report on the general coal position was received.

Dr. E. V. Evans, Chairman of the Gas Advisory Committee to the Ministry of Fuel and Power, made a report to the Board on the questions discussed at the last meeting of the Gas Advisory Committee, referring, *inter alia*, to the following matters: (*a*) War damage and bombed property, (*b*) calorific value, (*c*) the cooker and meter position, (*d*) meter rents.

A letter from the British Gas Federation which had been circulated to the members of the Board was considered, asking for nominations to a new Committee which it was proposed to appoint to undertake the work of reconstruction and reorganization arising from the Report on the Planning of the Gas Industry. It was stated that The Institution of Gas Engineers had already appointed three representatives to this Committee—viz., Dr. E. V. Evans, Mr. Jas. Jamieson, and Mr. S. E. Whitehead—and that the British Commercial Gas Association, the Society of British Gas Industries, and the Gas Companies' Protection Association had been asked to do the same. The Board nominated the following three members to represent the National Gas Council upon the new Committee: Mr. C. S. Shapley, Mr. A. W. Smith, and Mr. A. E. Sylvester.

A letter which had been circulated to the members of the Board, and which was addressed to the Council by the Federation of British Industries, dated December 2, 1943, stated that a Conference had recently been convened by the Design and Industries Association to consider proposals for making available national designs for equipment in the home—*e.g.*, bathroom fittings, lighting fittings, door furniture, and heating and cooking apparatus. Inasmuch as not only the British Commercial Gas Association but also the Society of British Gas Industries would be greatly interested in this matter, the Board agreed that the letter be referred to the British Gas Federation.

A report had been circulated to the Board with regard to an appeal issued by the Worshipful Company of Paviors for increased contributions to ensure the re-establishment of the Chair of Highway Engineering at the University of London. The matter was remitted to the British Road Tar Association, seeing that they had been in the past one of the largest contributors.

The next meeting of the Board will take place on Jan. 11, 1944.

Extra Coupons for Gas-Workers

The Board of Trade has decided after consultation with the Trades Union Congress and the British Employers' Confederation to repeat during the 1943–44 clothes rationing period the issue of ten additional clothing coupons made for many workers during the last period. The categories of workers eligible for the extra coupons are substantially the same as before, and include those workers in the Gas Industry whose occupation imposes greater wear and tear on clothing than does sedentary or light work. Part time workers in eligible occupations will be able to apply for the extra coupons if they work 22 hours or more per week, and supervisory workers if they are exposed to exceptionally hazardous conditions. Arrangements have again been made to issue the coupons to workers newly entering employment in the course of the rationing period.

The coupons will be issued as before through local offices of the Ministry of Labour and National Service to employers for distribution to their workers. They will be available up to Feb. 26, together with application forms and leaflets giving full details of the workers eligible and the method of application. Special arrangements are being made for certain industries in which there are some workers with exceptionally heavy needs. Details of these are being notified to the employers and workers concerned through the employers' organizations and trade unions.

THE MECHANISM OF CARBONIZATION IN CONTINUOUS VERTICAL RETORTS*

By Dr. A. E. HAFFNER and Dr. F. R. WESTON

Gas Light and Coke Company

(*Concluded from p. 753*)

The protective effect is shown by the percentage wear on the brickwork at different levels, as shown in Table I and fig. 5.

TABLE I.—SCURF THICKNESS, WEAR ON RETORT WALLS, AND CARBON PENETRATION.

Depth down retort.	Scurf thickness.	Wear on retort walls.	Carbon penetration.
	in.	in.	
11 in.	...	*Nil*	...
3 ft. 0 in.	4/32	2/32	100%
5 „ 1 „	5/32	6/32	75%
7 „ 3 „	4/32	6/32	35%
9 „ 4 „	6/32	8/32	30%
11 „ 6 „	8/32	12/32	20%
13 „ 7 „	7/32	14/32	*Nil*
15 „ 8 „	2/32	18/32	...
17 „ 9 „	Trace	18/32	...
20 „ 0 „	*Nil*	16/32	...

Some of the gas cracking leads to deposition of lampblack, not on the retort but on the coke surface. Vertical fissures of the coke monolith had lampblack within the fissure, which was a proof that fissuring had occurred relatively high up in the retort, whereas horizontal fissures formed by thermal contraction occurred on a level where there were few hydrocarbon to crack.s There was no lampblack within these fissures.

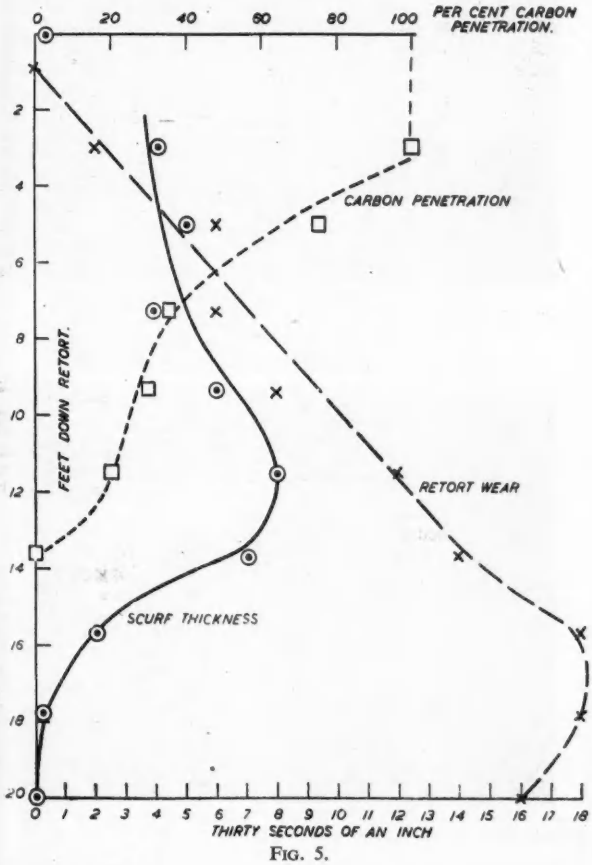


FIG. 5.

Associated with scurf deposition, there appeared examples of carbon depositions within the material of the retort walls, which were tinted grey. The degree of penetration was complete at the top of the retort, but gradually decreased to zero at 12–13 ft. down the retort, where the scurf deposition was a maximum. A sample of the affected brickwork on ignition lost its grey coloration, which therefore appears to be due to carbon resulting from thermal decomposition of hydrocarbons. A. T. Green ("GAS JOURNAL," Carbonization Conference, No. 1928, p. 70) drew attention to an example of this phenomenon in a coke oven wall.

* Paper to the Southern Association of Gas Engineers and Managers (Eastern Section), Nov. 26.

Structure of the Charge

The charge was found to be a coherent monolith capable of holding together even after the supporting retort wall had been partially removed. Apart from occasional irregular voids the charge occupied

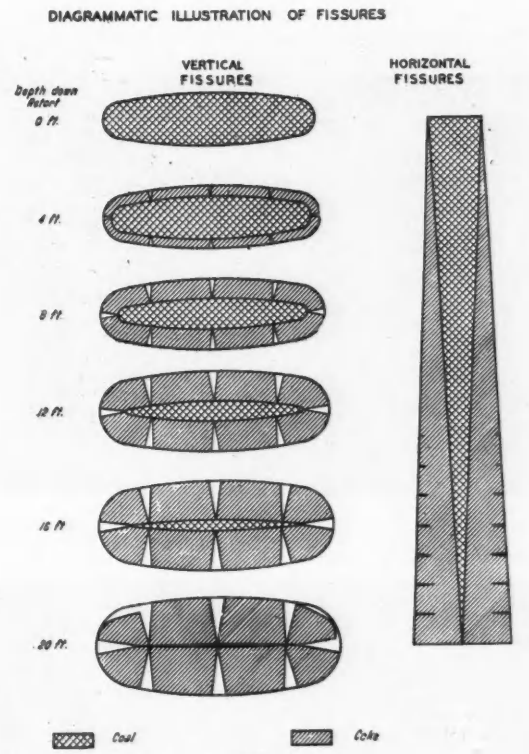


FIG. 6.

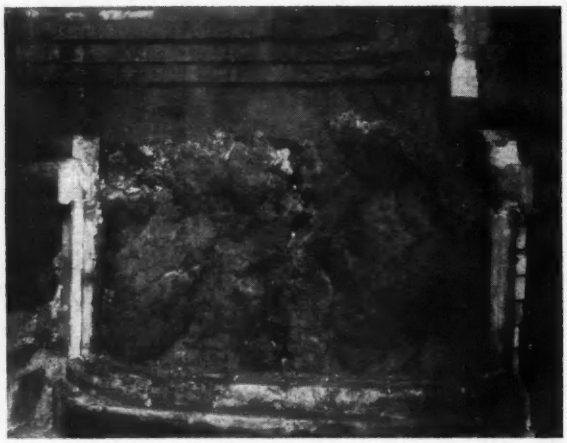
the full cross section of the retort. There were vertical fissures, which became more pronounced lower down the retort. In the lower half the charge showed a tendency to be fissured horizontally as well. The outer surface of the charge was matt with lampblack; the next layer was light coke about 1–1½ in. thick, which could be peeled off the remaining coke of denser composition (samples S4/13, A and B). At those levels where the coal was still to be found the zones of coke and coal were separated abruptly by a narrow semi-plastic zone (samples S4/25, 23 and 24, A and B.) Even on these sections it is probable that carbonization had proceeded to some further extent after quenching.

These simple facts seem to be accounted for by the following explanation of the course of events during the passage of coal through the retort.

Coal enters the retort, and at the base of its angle of repose flows over the full cross-sectional area of the retort. Heat is received quickly from the retort wall and from hot gaseous products arising from lower down the retort. An elliptical wall of coke is formed and this first-formed coke is exceptional for its lightness, which is related to rapidity of heating and possibility of freedom to expand upwards because there is no superimposed weight of charge above it. As this elliptical wall of coke, with the uncarbonized coal within it, descends

Depth down Retort—10 ft.

Depth down Retort—14 ft.

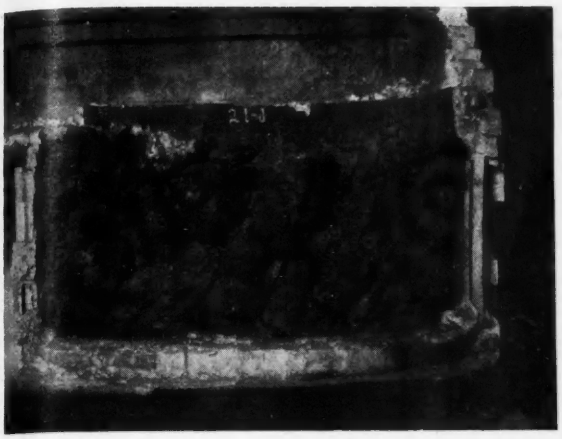


Depth down Retort—16 ft.

FIG. 7.

the retort, the increasing cross-sectional area of the retort makes space available for expansion. Through the pressure of the carbonizing coal, the coke wall is burst and the segments come into contact with the retort walls, which stop further expansion at this level. With a further descent of the charge there is again a rupture of the second skin of coke, and it is natural that the fissures in the outer skin of coke should extend into the second skin. This process continues as long as there is an increase in the cross-sectional area of the retort, and as long as there is coal left to carbonize and provide the bursting pressure. With the disappearance of the coal core the fissures extend from the retort wall to the centre of the charge.

An idealized presentation of this process is shown in fig. 6, which



Depth down Retort—18 ft.

Depth down Retort—25 ft.

FIG. 7—*continued.*

was constructed by dividing the ellipse at the top of the retort into eight equal arbitrary sections, and these lengths are distributed on lower charge perimeters. At any level fissures can be constructed by joining the distance between the lengths to a point on the semi-plastic layer. The fissures form equally on either side of the normals to the surface of the retort.

The relatively simple impression created by this drawing should be further modified to take into account three more factors:

(1) The "arcs" of the top of the retort are much more curved than those on the lower parts, and further small voids can be accounted for by this lack of coincidences. In fig. 6 two of the coke segments at 20 ft. down have been drawn so as to retain their initial curvature.

(2) The prolonged heating of the outer layers of coke causes a contraction of the charge due to graphitization of the coke and loss of hydrogen from the space lattice. It is now possible for these fissures to be horizontal as well, because the weight of the charge can be borne on the central core, which has suffered no thermal contraction.

(3) There is a loss of 50 lb. coke per ton of coal or 70 lb. coke per ton of coke = 3% due to water gas production, and the fissures are widened by this loss of coke.

The photographs of the cross-sections taken during the dismantling show these radial fissurings and both the vertical fissures and the horizontal fissures caused by contraction are shown in the photograph of the side elevation of the charge (Fig. 7). The idealized drawings are in agreement as a simplified version.

The monolith of coke on entering the bell appears to split along the major axis, which would naturally be the line of cleavage, into two half monoliths which no longer fill the available space (fig. 8).

The structure of the charge in the steaming chamber suggests that the distribution of the coke masses is unfavourable for attaining good contact between the steam and coke. The relatively slow descent of the coke through the steaming chamber, however, gives opportunity for carbonization to proceed to completion without having to supply further heat through the retort wall.

From the steaming chamber the charge has to be compressed again in order to descend on to the worm in the conical worm casting. As far as could be ascertained by examination from below, the top turn of the worm was in each case full of coke, which then thinned out towards the trailing edge, giving an average depth of 10 in. of coke on the bottom half-turn of the worm.

The fact that the charge is very heavily fissured and only occupies approximately 30% of the volume of the steaming chamber explains why this narrowing of the retort section does not cause a hold-up. The charge will easily disintegrate at the horizontal and vertical fissures into primary pieces of coke of about 9 in. cube. These will be separated or broken down further by the leading edge of the worm, which cuts off a section of 15 to 16 in. deep as it revolves, and allows this coke to slide away down the remaining portion of worm.

The views expressed can be demonstrated by means of a scale model (Fig. 9), in which an attempt has been made to indicate the principles involved in the structure of the charge and the mechanism of its movement rather than to convey an accurate pictorial presentation. The location of the coal core has been determined by somewhat intricate calculations of heat flow, but is confirmed by the observed position of the coal core in the lowest sections of the "frozen" charges. The fissures have been constructed as indicated above.

To recapitulate with the aid of the model, the coal enters the retort and fills the whole cross-section. As heat is received an outer skin of coke is formed, but as the charge descends further, the pressure of carbonizing coal disrupts the outer sheath of coke and forms radial fissures. These fissures deepen and widen as the charge descends still further. In the lower portion of the charge, horizontal fissures begin to appear through the contraction of the most heated portion of the coke. The inner coke, having been less heated, is not yet ready to fissure horizontally through thermal contraction, and it is therefore possible for the charge to retain its monolithic structure. On reaching the bell bottom the charge through the wedging action of the boss of the extractor splits along the major axis along a natural plane of the cleavage into two half monoliths; which retain their coherent structures until compressed by the converging wall of the worm casting. Here the charge breaks up into primary large coke along the primary fissures and covers 360° of the worm. The leading

edge of the worm penetrating the mass of coke supports the charge of coke above it and releases the coke below it. The released coke splits along secondary fissures during this action and the coke flows towards and over the trailing edge of the worm.

The model also shows the location of scurf and of carbon penetration. There is also included some thermal data, such as outer and inner wall temperatures at each level.

The mechanism of carbonization as involving successive rupture of concentric sheaths of coke as explained above leads to the view that the retort section should continue to increase down to the point where carbonization is completed. In the case of a retort having the taper confined to the upper portion, the coal remaining in the lower

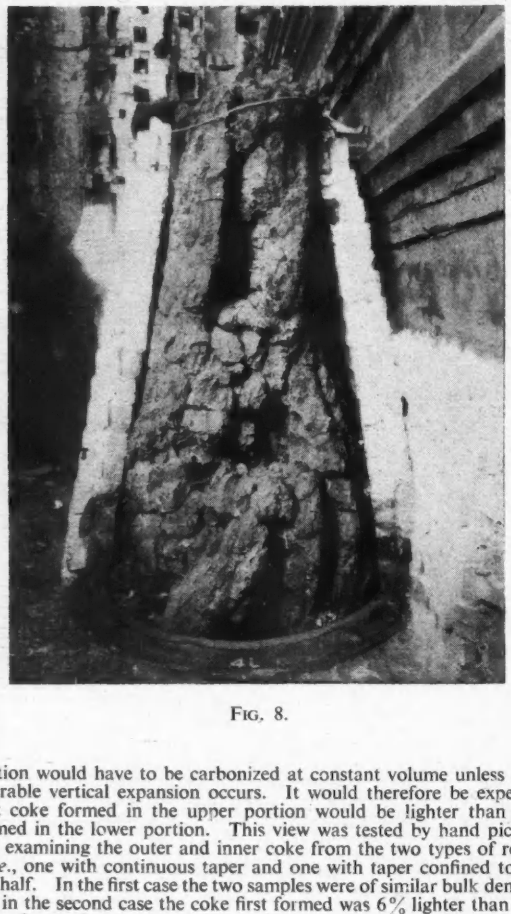


FIG. 8.

portion would have to be carbonized at constant volume unless considerable vertical expansion occurs. It would therefore be expected that coke formed in the upper portion would be lighter than that formed in the lower portion. This view was tested by hand picking and examining the outer and inner coke from the two types of retort —*i.e.*, one with continuous taper and one with taper confined to the top half. In the first case the two samples were of similar bulk density, but in the second case the coke first formed was 6% lighter than that formed at a later stage.

APPENDIX 1.

CARBONIZATION RESULTS—DURHAM COALS.

	Date of test.		
	May, 1931.	April, 1933.	May, 1938.
Duration (days)	28	14	10
Age of retorts (days)	200	500	550
Number of retorts gas making	53.2	60.6	59.8
,, ,, scurfing	2.8	3.4	4.2
Combustion chamber temperatures—°C.			
Rows 6 to 10	1,227°	1,208°	1,175°
Rows 1 to 5	1,349°	1,323°	1,319°
Coal:			
Tons per retort gas making per day	4.37	4.07	4.41
Ash plus moisture content %	9.7	9.0	8.0
Fuel (dry) to producers:			
Tons per 100 tons coal	13.6	13.9	13.6
lb. per therm gas made	3.9	4.0	3.75
Gas:			
Calorific value (B.Th.U. per cu.ft.)	507.4	499.8	498.9
Therms per ton of coal (as carbonized)	78.9	79.0	81.1
Therms per retort gas making per day	345	319	359
*H.E.V. (therms per ton coal 8% ash plus moisture)	34.2	34.2	34.7
Gas analysis:			
CO_2%	3.1	3.2	4.3
O_2%	0.5	0.7	0.6
CO%	11.9	12.3	11.7
N_2%	6.0	6.7	5.0

*Hydrocarbon Enrichment Value—S. Pexton, *J. Inst. Fuel* (1935), **8**, 200–213.

It is felt that a technique has been developed which with further improvements could be applied to the examination of the structure of the charge in other installations of continuous vertical retorts. The correlation of all the evidence to be collected might lead to a more fundamental approach to retort design and operation.

APPENDIX 2.

DESCRIPTION AND ANALYSIS OF SAMPLES.

Number.	Sample description.	Volatile matter %	Ash %	B.S.I. swelling index.	Apparent density.
	Coal from No. 2 retort coal box	30.9	6.1	7	...
	Coal from No. 4 retort coal box	30.2	9.6	8 to 9	...
S4/2	Scurf from under offtake pipe	3.1	3.1	...	...
S4/9	Top of charge under offtake pipe	7.3	4.4	...	0.67
S2/4	1 in. to 2 in. thick skin coke from 9 ft. 6 in. down retort	1.8	6.5	...	0.55
S2/5	Inner coke from same level	6.3	11.9	...	0.77
S4/13A	1 in. to 1½ in. thick skin coke from 11 ft. 6 in. down retort	0.9	8.8	...	0.62
B	Inner coke from same level	1.3	10.7	...	0.72
S4/17	Coal from core, 18 ft. down retort	29.5	6.3	9	...
S4/20	Hard coke from ends of major axis at same level	2.9	11.4	...	0.66
S4/21		2.7	12.4	...	0.88
S4/25	Coal lumps from last 2 ft. of core	30.0	13.2	7½	...
S4/23	Semi-coke from end of core	26.4	10.8	5½	...
S4/24A	Transition from semi-coke to coke	18.1	9.6	2	0.72
B		6.8	11.7	non-agglomerating.	0.87

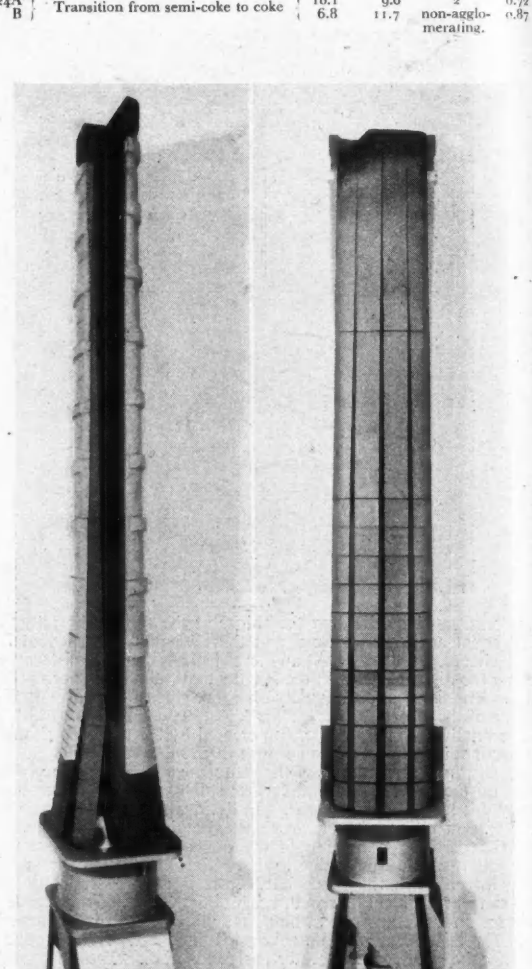


FIG. 9.—¼ *Scale Model.*

View with ¼ of retort and charge removed. *Front elevation with front of retort removed.*

(*Continued on p. 787*)

DISCUSSION

Colonel **F. J. Bywater,** called upon by the **Chairman** (Mr. J. M. Webber, of Croydon), paid tribute to the Authors for the valuable data which they had presented, and he hoped that the Paper would be a pointer to further investigations on the subject. It was quite obvious that great care and thoroughness had gone into the work. It might interest those present that many years ago he himself had delved into the subject of refractory materials, and it was good to know at the present time the drastic treatment to which the setting of retorts had been subjected by the sousing of water had had a negligible effect. Perhaps this was a tribute to the remarkable work of the British Refractories Research Association, the formation of which he well recollected; and in those days a working life of three hundred days for retort settings could be expected, whereas the Authors had spoken of a life of three thousand five hundred days before letting down the settings for demolition and the purpose of this present investigation. And here he must pay a tribute to the manufacturers of refractory materials, for in his own Company, settings of retorts had worked consistently and well for four thousand days. He thought from the cross-sections of the charge shown that the designers of retorts would be able to incorporate in their designs the best taper to avoid voids, and thereby to avoid degradation due to over-cracking of the hydrocarbons evolved from the coal. Coming to another aspect of the Paper, the swelling index of coals, he was not at all certain that the standard of swelling index accepted by the British Standards Institution was correct. Years ago in the South Metropolitan Gas Company's coal-testing station in Newcastle they had developed a method based upon the well-known Audibert test which measured the expansion of coal on the cylinder principle. This method, he suggested, gave a wider and closer range of assessment and better reproducible results than the B.S.I. agreed method. Colonel Bywater ended his remarks by suggesting that Durham coal covered a wide variety of coals from different seems, and that one coal from a single seam would give in a retort an expansion effect different from a coal in almost an adjacent seam in the Durham coalfield, and on this account alone it was wholly necessary to take constant account of this variation.

Dr. **R. Lessing** said that he welcomed the Paper because it gave clear indication of a new technique, and he was certain that they would learn a great deal from it of the carbonization process in general.

He believed that the Authors had given an excellent analysis of what happened to coal when carbonized in vertical retorts, and he thought that the experimental technique described should be multiplied in other works. Had, he asked, the Authors considered whether, in the travel down of the charge, the coal at the end of the taper was or was not truly carbonized. His point was this—that when heating coal from the outside there was a continuously changing outer skin, in which reaction there was released a type of pitch which travelled forward into the neighbouring cooler layers of the charge and the vapours of which were condensed. He suggested that the coal would have a capacity of combining with the pitchy and tarry matters to form some sort of solution, and that by this time the heat reached a second layer not applied to the original coal. As this second layer was heated it sent the primary heavy charges to the outer zones. Dr. Lessing went on to suggest that the coal core at the base of a vertical retort was not to be confused with coal, but was something quite different, and at this stage of the continuous vertical carbonization process they were in fact treating a modified raw material. Another observation in the paper which interested him was the question of scurf deposition on the refractory brickwork and the carbon penetration in it. This showed such an interesting distinction between two separate phenomena. There was demonstrably a conspicuous difference between the raw material constituting the scurf formed on the lower layers of the retort and what he suggested was the interpenetration of the brickwork by gaseous compounds, as distinct from the carbonization of the primary compounds of the pitch in the lower regions of the retort.

Dr. **Haffner,** replying to Dr. Lessing, assured him that as far as his interpretation of investigations went the coal was just the same at the bottom of the retort as at the top.

Mr. F. M. **Birks** (Chief Engineer, Gas Light and Coke Company) said that what he looked forward to was further experiments on designs of retort of different shapes, for obviously one could not expect the same results as those given by the Authors if a retort design was different; and he was hoping that in the interests of carbonizing progress someone else who had retorts due for demolition would undertake a similar investigation to that outlined in the Paper.

Dr. H. **Hollings** (Gas Light and Coke Company) emphasized that the Authors had given a description of what was a new technique, the possibilities of which ought to be realized. The opportunity for such work occurred only rarely, and he would direct attention to the evidence in the Paper obtained from the employment of tallies. Dr. Haffner had stressed the possibility that the odd positions of certain of the tallies found might have been due to rodding, but they should not overlook the possibility that there might be other explanations to account for this. And he would suggest that other experiments using tallies could be undertaken before the retorts had arrived at the end of their useful life. They could make arrangements for collecting the tallies at the bottom of the retort. Analysis of the results to be obtained from retorts of larger cross-section might well prove interesting.

Dr. **J. G. King** (Director of the Gas Research Board) said he had read with great interest the account which Dr. Haffner and Dr. Weston had given them of the heroic measures they had taken to enquire into the mysteries of the behaviour of coal in continuous vertical retorts. Many years ago he attacked the same problem by exploring the retort, while working, with a long thermocouple. The results were quite illuminating, since one could deduce the state of carbonization of the coal from its temperature, detect the presence of cavities and fissures, and follow the path of the slowly-carbonizing cone. The new method described, however, was a very much better weapon, and he would like to see the work extended by the Gas Research Board, which was naturally interested in all the research work carried out by gas undertakings. The Authors had described how they used pieces of metal and brick as tallies, and he wondered whether they had any evidence that the relatively heavier metal moved more rapidly than the brick through the more fluid parts of the mass. There were signs that more points in the rate curve of retort No. 8 might have shown a more distinct elbow for metal tallies. Rodding might also affect metal tallies more than brick. The variations in scurf thickness were not reflected in the curve of retort wear; one might have expected that they would be reflected, especially as the bulge in the scurf curve might have been more pronounced but for the scoring effect of the coke. Was carbon penetration therefore a factor in retort wear, and was the wear curve the result of composite action represented by the other two curves, the top part of the curve being wear caused by loss of strength when burning out carbon?

Continuing, Dr. King said he found of special interest the indications that the plastic zone was very narrow. The Authors had noted this, and were not sure that some carbonization did not occur after quenching and that the plastic zone was really wider. He felt this was an important point, and he wondered if the Authors could link the observation with a more exact definition of the properties—caking power, &c.—of the particular Durham coal used.

He thought the Authors had been very modest in making no special claims regarding their findings, but they must have ideas, and he hoped that they and others would continue investigations on these lines so that these ideas might be expressed before long. There were suggestions one might make to them, but he had no doubt most of these were already in their minds. One might relate to the variation of taper in the retort. Durham coals were not all the same, and it would be interesting to observe how taper affected the charge in the case of Durham coals of similar composition but developing different swelling pressures. The problem of wear was, of course, most serious near the bottom of the retort. Was this wear due solely to erosion of the refractory, or was it partly chemical due to the liberation of ash on steaming? This was difficult to discover unless one retort was run on coal of the same ash composition for a long period. Also, why did wear increase steadily when the scurf was there to protect? The observations on carbon formation were of primary importance. Scurf was only a small percentage of the coal charged, but the coke cells contained much more. He did not recollect that anyone had attempted to calculate the effect on gaseous thermal yield of uncontrolled cracking of this type. Perhaps an idea of the magnitude of the effect would set a target at which it would be worth while to aim.

Mr. **A. G. Bird** (West's Gas Improvement Company, Ltd.), who referred to the large number of refractory shapes involved in the construction of retort settings, said his Company would be glad to give what practical assistance it could to the furtherance of the work described by the Authors.

Dr. **E. W. Smith,** C.B.E., commenting on the new technique as almost epoch making, suggested that the personal factor was most important in work of the kind, and that it was desirable that one team of investigators should follow through all the work. His own Company, the Woodall-Duckham Company, would welcome similar investigation on the rectangular retort; and he heartily agreed with the Authors that at this stage it was not opportune to draw conclusions, and they certainly should not mix up static carbonization with continuous operation.

Dr. **S. Pexton** (Gas Light and Coke Company), proposing a vote of thanks to the Authors, said he did so really on behalf of Mr. Wilsmer, at whose works the experiments were carried out under exceedingly difficult wartime conditions. He would like to draw attention to the importance of solid models and three-dimensional diagrams. Before the war a scheme was on foot for models of gas plant at the Science Museum, but it should not be difficult for any large undertaking to construct solid models of gas plant, and it would certainly be very helpful.

Mr. **F. Dawson** (North Middlesex) seconded the vote, and Dr. **Haffner** replied.

A Three-Lecture Course for girls in the A.T.S. and W.A.A.F., which will probably be attended later by the W.R.N.S., is being held in the lecture hall of the Newcastle and Gateshead Gas Company. The lectures are on homecraft subjects arranged by the N.E. Regional Committee for Education in H.M. Forces.

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THE MANUFACTURER AND THE GAS INDUSTRY*

By H. R. HEMS,

Superintendent, Industrial Heating Section, City of Birmingham Gas Department, and Chairman, Industrial Gas Centres Committees

(*Continued from p. 757*)

The use of continuous bright annealing furnaces ensures a much more rapid cycle of heat treatment, avoiding the necessity of carrying a large stock of pressings as in the normal batch type annealing shop. This is a very important consideration, not only on economic grounds, but also owing to the fact that the manufacturing cycle for a given pressing can be shortened from weeks to days, particularly on complex pressings calling for a large number of intermediate anneals.

The radiant tube system of firing—burning gas inside a special alloy tube—eliminates the use of expensive metallic muffles, and ensures maximum heating economy for indirect firing, wherein the products of combustion must on no account come into contact with the work under treatment.

The compression roller hearth developed by the Incandescent Company, consisting of special refractory moulded blocks maintained in compression, can be operated at temperatures in excess of 1,000°C. without any cooling whatever, thereby greatly increasing the overall efficiency of the furnace as compared with earlier designs where heavy heat loss had to be met either in the form of water cooling or dead metal, such as chain conveyors.

The purging gas, provided by separate D.X. Plant, is obtained by the partial combustion of town gas with precision control of the quantities of gas and air, enabling gases of the desired chemical analysis to be recovered from the combustion "pig." These gases are then passed through suitable condensers, desulphurizing units and silica-gel driers, and delivered into the furnace chamber under a positive plenum, sufficient to ensure the absolute exclusion of atmospheric air.

Heat Treatment

In the Midlands the semi-continuous through type gas-fired oven furnace will continue to find favour for the heat treatment of forgings, billets, and castings. A particularly good furnace of this type, developed by Messrs. Lucas Furnaces, Ltd., incorporates both load and air recuperation, the gradual raising of the component to the predetermined temperature without overheating, the elimination of empty furnace periods between unloading and reloading, and ease of control of temperature, atmosphere, and handling.

Working chamber.—2 ft. 6 in. wide by 15 ft. 6 in. long (including 5 ft. 6 in. load pre-heating) by 1 ft. 6 in. high.

Employs *load* recuperation, also *air* recuperation, by tubular metal recuperators.

Combined form of radiation and convection resisting insulation, with 14 in. thick walls.

Doors well insulated and lifting counterbalanced, operated by a continuous chain with ball bearings on shafts.

Charging machine of electrically operated pushing mechanism.

Containers made in heat-resisting cast alloy 26 in. by 26 in. by 5 in.

The following are particulars of a test carried out in a furnace of the above type:

Gas consumption test, per gross ton of steel heated to 820°C. taken during continuous operation after obtaining initial temperature and with full load:

Period of test	10 hours.
Number of containers treated	54.
Total gross weight	12,125 (forgings and containers).
Total gas used	11,400 cu.ft.
Cu.ft. per lb.	0.94.
„ per ton	2,105.
Thermal efficiency	50%.

Normalizing Continuous Pusher Type Furnace

An excellent example of the machine development in continuous automatic furnaces is an installation recently put into operation in a factory in the Midlands by Messrs. British Furnaces, Ltd.

The furnace is designed for an ouput of one ton of forgings per hour heated on trays of heat-resisting alloy, which are placed on a roller charge table arranged to carry two trays. The trays depress the limit switches connected to the charge door and the rack and pinion type electrically driven pusher.

After a predetermined time, the charge door opens and a contact is made which starts the pusher gear, thereby delivering a pair of loaded trays into the furnace. The pusher then commences its backward stroke and the door is closed, both being stopped by the limit switch. No further movement takes place until the end of a further predetermined interval, which is varied according to the heating cycle required, when a clock makes a contact causing a repetition of the above sequence.

When a pair of trays reach the discharge end of the furnace, thereby completing the heating and cooling cycle, they depress a bar which starts the discharge door, which during its upward movement causes a number of live rollers to commence turning, thus bringing a pair of loaded trays out of the furnace. While on the discharge table they cause the door to close and the live rollers to stop.

The furnace is designed to heat forgings to temperatures between 900° and 1020°C., which are held for one hour before the work is passed through a short fast cooling zone and then through a long slow cooling zone, which brings the temperature down to 300°C., before the trays are discharged.

The overall dimensions of the furnace are 13 ft. 4 in. by 57 ft. 6 in. long, and the hot zones are built of insulating refractory backed with efficient heat-resisting insulation, all enclosed in a steel casing.

The burners are of the automatic proportioning type arranged to fire above and under the work, and adapted for independent adjustment, although they are situated in groups controlled from two Kent automatic temperature regulators.

The fast cooling zone is interesting, since the temperature is controlled automatically, air being drawn through heat-resisting tubes placed above and below the work. If the cooling is not sufficiently rapid, air is drawn through these tubes, but it is shut off if the temperature falls too fast.

When operating at a nett capacity of one ton per hour and at a temperature of 900°/1020°C. the gas consumption in the soaking zone is about 6,250 cu.ft. per hour.

This furnace has been installed as an additional production unit to a furnace of the walking beam type by Messrs. Gibbons Brothers, Ltd., which has been in continuous production for 10 years. During the first two years it dealt satisfactorily with a throughput of 50 tons per week, and during the last eight years 75 tons of forgings per week. It is at present undergoing a much-needed rebuild of the main heating zone.

Normalizing—New Permeable Lining Furnace

A valuable contribution to the development of industrial gas furnaces has been made recently by the Yorkshire Industrial Gas Development Centre, who have been working on the basis that leakage of hot gases from furnaces when under control can reduce the overall losses from the furnaces and thereby improve the efficiency.

Considerable research and practical development work has been carried out by this particular Centre with the Leeds University, firstly into the permeability of various bricks, which finally led them to the idea that the exhaust of all the products of combustion from the furnace *via* the permeable lining was possible. Practical tests were made on crucible furnaces and the results compared with recognized furnaces of similar capacity, which indicated the possibility of a 25% economy in favour of the permeable lined furnace when used for melting, and under maintaining conditions, an economy of up to 50%.

Probably the most practical demonstration of this method of working is incorporated in a furnace built by Messrs. British Furnaces, Ltd., with a hearth 7 ft. 6 in. back to front, 3 ft. 9 in. wide, and 22 in. to crown of arch arranged for two-prong charging machine working on the normalizing of forgings in a North Country works. This furnace incorporates a permeable lining over the whole interior, except, for strength reasons, at the burner blocks and on the hearth itself. Low pressure velocity burners are used with an exhaust fan on the flue. The furnace operates under automatic temperature control, and has been running under normal works conditions since April of this year.

The following are working details which have been obtained:

Steel castings normalized at 900°C.

Working 12 hours per day, five days a week.

Heating from week-end to shut down	20 minutes.
„ „ overnight „	10 „
Maximum gas per hour	2,000 cu.ft.
Minimum „	200 cu.ft.
Average to maintain at 900°C.	300 cu.ft./hr.
„ gas consumption obtained over one month run at loads approximately 3,000 lb. gross	1.2 cu.ft./lb.

It is hoped that a publication of this work will be made in the near future by the Yorkshire Centre.

Continuous Hardening and Tempering of Small Steel Parts

Some years ago the Gas Light and Coke Company's Centre designed special furnace equipment for the continuous hardening and tempering of small steel parts, and since, many installations have been completed satisfactorily. Modifications and improvements have been made to the original design, and the present model handles a varied selection of parts, giving uniformity of finished product with a very small percentage of scrap.

(*To be continued*)

* Paper to the Scottish Junior Gas Association (Eastern District).

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Dec. 20.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

The new Coal Tar Products Prices Order, 1943 (S. R. & O. 1528), came into force on Nov. 15, fixing the prices at which Coal Tar Oils may be sold for various specified purposes. It also confirms the prices which may be charged for other Coal Tar Products under earlier Orders.

An Order entitled The Control of Toluene (No. 3) Order, 1943 (S. R. & O. 1943, No. 976), came into force on July 20, and introduced certain changes in the prices for different grades of Toluene.

There are no changes to report in the prices of Coal Tar Products.

The Provinces Dec. 20.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 11d. to 2s. 1d., pure, 2s. 7½d. (controlled by the Control of Toluene No. 3 Order, dated July 14, 1943, operative from July 20, 1943). Naphtha and Xylole controlled by the Coal Tar Naphtha and Xylole Order, 1943, dated May 31 (S. R. & O., 1943, No. 768), operative from June 1. Carbolic acid, 60's, naphthalene, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland Dec. 18.

Both Home and Export Markets continue active. Refined tar*: Yield to Distillers is 4½d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzol absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 6½d. to 7d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

The week opened with a continuance of selective buying of home industrial shares, but this eased up later and markets became quiet and irregular, although cheerful on the better news of the Prime Minister.

The volume of business in gas stocks and shares was exceptionally small, which is not usual at this time of the year, but with few exceptions all prices were maintained at their previous week's levels. It will be noticed that a number of fixed-interest stocks were marked *ex div.*

The following changes in quotations were effected during the week:

SUPPLEMENTARY LIST

Brighton 5 p.c. Deb. (*x.d.*)	115—120	Dec. 13

OFFICIAL LIST

Bournemouth 4 p.c. Deb. (*x.d.*) ...	97—102	Dec. 13
British 5½ p.c. "B" Cum. Pref. (*x.d.*)	110—115	"
Ditto 4 p.c. Red. Deb. (*x.d.*) ...	92—97	"
Imperial Continental	83—87	—1
Plymouth & Stonehouse Ord. (*x.d.*)	100—105	Dec. 13
Primitiva Holdings, 6 p.c. Red. Cum. Pref. (*x.d.*)	100—105	"
South Suburban 5 p.c. Deb. (*x.d.*)...	119—124	"
United Kingdom Gas Corporation Ord.	20/6—21/6	—/3d.
Ditto 4½ p.c. 2nd Non-Cum. Pref. (*x.d.*)	17/—19/-	Dec. 13
Wandsworth 5 p.c. Deb. (*x.d.*) ...	119—124	"
Ditto 4 p.c. Deb. (*x.d.*)	97—102	"

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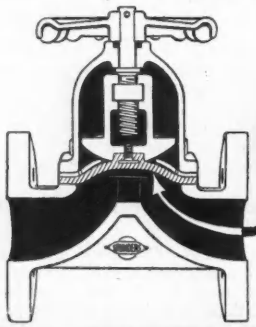

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